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THE DEDICATION OF THE ENGINEERING BUILDING OF THE UNIVERSITY OF PENNSYLVANIA.

A COMPARISON OF UNIVERSITY AND INDUSTRIAL DISCIPLINE AND METHODS.

THE point from which I view college education is that of the employer, not that of the educator. I have had no experience with the difficult and complicated problem that faces the professors and the governing boards of our colleges. On the other hand, I have been engaged for years in organizing the shop, office and commercial management of quite a wide range of engineering and manufacturing establishments. This has brought me into intimate personal contact with a large number of college graduates, and I have become well acquainted with their strong points, which are many, and at the same time with a few of those points in which it would seem that as a class they might be improved. And in what I shall say I have principally in mind the preparation of young men for success in commercial engineering and industrial enterprises; in other words, enterprises outside of the four learned professions.

I despise the pessimist who sees nothing but the defects and blunders of mankind, and the scold, whose pleasure it is to complain of all things as they are.

Let me say at the start, that without question our college graduates as a class represent the finest body of men in the community. And as to the value of an engineering course for men in our profession, our fellow-townsman, Mr. Jas. M.

Dodge, in his admirable paper on 'The Commercial Value of an Education,' has shown through carefully gathered statistics, that within a few years after graduation the college educated engineer far outstrips in position and salary his average competitor who comes up from the ranks.

It would be a much more congenial task to dwell upon this view of the profession, but something may possibly be gained by considering what has seemed to many of the friends of our young graduates to be the one defect which they practically all have in common.

For a period of from six months to two years after graduating they are, generally speaking, discontented and unhappy. They are apt to look upon their employers as unappreciative, unjust and tyrannical, and it is frequently only after changing employers once or twice and finding the same lack of appreciation in all of them that they finally start upon their real careers of usefulness.

On the other hand, the attitude of employers towards young graduates is fairly expressed by the following written instructions given for the selection of quite a large number of young men to fill positions which presented opportunities for rapid development and advancement. These instructions were to give the preference—first, to graduates of technical schools; second, to the graduates of the academic departments; but to employ no college boy who had not been out for more than two years.

Why is it, then, that these young men are discontented and of practically little use during the first year or two after graduating?

To a certain extent this is unquestionably due to the sudden and radical change from years spent as boys almost solely in absorbing and assimilating knowledge for their own benefit to their new occupation of giving out and using what they have for the benefit of others. To a degree it is the sponge objecting to the pressure of the hand which uses it. To a greater degree, however, I believe this trouble to be due to the lack of discipline and to the lack of direct, earnest and logical purpose which accompanies, to a large extent, modern university life.

During the four years that these young men are at college they are under less discipline, and are given a greater liberty than they have ever had before or will ever have again.

As to college discipline, it can not be a good training for after life for a young man deliberately to be told by the university authorities that he can flagrantly neglect his duties sixty times in one term before any attention will be paid to it; while, if in business, the same young man would be discharged for being absent two or three times without permission.

And, as to the freedom offered by the modern university system, it is not true that boys from eighteen to twenty years old have the knowledge and experience necessary to select a logical and well-rounded course of studies, and even if they had this wisdom, the temptation to choose those studies which come easiest is so strong that it would be unwise to throw upon them so great a responsibility. Nor does it appear wise to leave each student free to study as little or as much as may suit him, at times doing practically no work for days, and at others greatly overworking, with no restraint or direction except the round-up which comes twice a year with examinations. At the least, it must be said that in commercial or industrial life this undirected liberty will never again be allowed them.

During the past thirty years two radical changes have occurred in educational meth-

ods. The kindergarten and its accompanying ideas have come for the children, and for the young men has come the change from the college, with its one or two courses carefully selected and rigidly prescribed by the faculty, to the university with as many different courses as there are young men, and in which, under the elective system, each student is given the choice of all of his studies.

The fundamental idea back of the change from college to university is excellent; namely, that of providing a far greater variety in the courses to suit the different tastes and abilities of the students, and to especially prepare them for their future occupations. Accompanying, however, this great step in advance, and yet, so far as I can see, in no way logically connected with it, has come the false step of giving our young men in many ways a greater liberty than is allowed, on the whole, to any other class of active workers; and of handing over to them the final decision in a subject most needing a master mind.

Commercial, manufacturing and other enterprises in which many men cooperate, are managed more and more by delegating all important decisions to a few men whose judgment has been trained through long experience, study and observation in those matters which they are called upon to decide. Yet many of our universities are managed by giving over to the young man, under the elective system, the final decision as to what studies will best fit him for his life's work, although he has, of necessity, but the vaguest idea of the nature of the subjects which lie before him. It is almost like asking him to lift himself up by his boot straps.

I can not but think that in changing country we have modeled largely after the English and German universities, which, as we know, are influenced in their management by traditions handed down through several hundred years; and that in adopting the great university idea of a variety of courses, we have at the same time blindly accepted the foreign idea of the elective system accompanied by a lax discipline, both of which are better suited to medieval times when each man worked for himself than to the present day when the road to success lies through true cooperation.

In this change, also, too great stress has been laid upon those elements leading to knowledge or book learning on the part of the student and too little upon the development of his character.

The kindergarten also, which has proved so great a help in training the younger children, making them observant and giving them a certain control over themselves, has brought with it one idea which has wrought great harm, and yet this bad idea is in no way properly or logically connected with the underlying principles of the kindergarten.

Somehow the average kindergarten child gets a firm conviction that it is the duty of the teacher to make things interesting and amusing, and from this follows soon the notion that if he does not like his studies and fails to learn much, it is largely the teacher's fault. Now, whatever views the parents or the teachers themselves should hold upon the duties of teachers, there is no doubt that the boys should have firmly in their heads the good old-fashioned idea that it is their duty to learn, and not that it is the duty of the teacher to teach them.

Along with the kindergarten plan of interesting and amusing children, the idea has taken firm hold in a large portion of the educational world that the child and young man should be free to develop naturally, like a beautiful plant or flower. This may again be an excellent view for the older person to hold, but it is a distinctly bad one for the young man to act

upon. He promptly translates the idea of developing naturally into wishing to do only, or mainly, those things which he likes or which come easy to him.

Of all the habits and principles which make for success in a young man, the most useful is the *determination to do and to do right all of those things which come his way each day, whether they are agreeable or disagreeable;* and the ability to do this is best acquired through long practise in doggedly doing along with that which is agreeable a lot of things which are tiresome and monotonous, and which one does not like.

Now neither the kindergarten idea, the university elective system, nor the lax college discipline tend to develop this all important habit in young men.

True cooperation, cooperation upon the broadest scale, is that feature which distinguishes our present commercial and industrial development from that of one hundred years ago. Not the cooperation taught by too many among those of our trades unions which are misguided, and which resembles the cooperation of a train of freight cars; but rather that of a well-organized manufacturing establishment, which is typified by the cooperation of the various parts of a watch, each member of which performs and is supreme in its own function, and yet is controlled by and must work harmoniously with many other members.

It is a mistaken notion that character of this kind needed for successful cooperation is developed by the elective idea of allowing each boy to choose for himself those things which he will do. It requires far more character to do successfully those things which are laid out for one by a wiser man than to do only what one likes, and in modern cooperation, while the work of each man is modified and more or less controlled by that of others, there is ample scope left for originality and individuality. We must remember that of all classes in the community, college boys are being trained to fill some day the position of leaders in the cooperative field. And there is no fact better established than that the man who has not learned promptly and fully to obey an order is not fit to give one.

An examination of the studies chosen by boys in the university academic departments will show that the logic and motive back of about one half of the students is that of obtaining an easy course, and even the better students show generally a lack of clear-cut logical purpose in their selection. In their case, the studies are chosen because the young man likes or is interested in the subjects, or because they come easy to him, rather than because they give a well-rounded and balanced course with a distinct logical purpose. The loose, flabby, purposeless courses chosen by fully one half of the students under the present system furnish but poor mental diet.

Why can not all of the good features of the elective system be better attained by permitting each young man to choose in general the object or purpose for which he wishes to educate himself, and then leaving the entire course of studies to the one or more professors in the faculty who are especially fitted to plan a complete and logical course in the chosen field? Let the young man say where he wishes to go, and let the faculty tell him the road he is to travel to get there.

As to the object of college life, some boys are sent to the university to learn how to mingle with men, and to form friendships which shall prove useful and agreeable in after life. Some go there to amuse themselves, and some to get the standing given by a college degree.

Something can be said for each of these objects. Is not the true object of all education, however, that of training boys to be

successful men? I mean men successful in the broadest sense, not merely successful money getters. Successful, first in developing their own characters, and second, in doing their full share of the world's work.

Young men should not come to college mainly to get book learning or a wide knowledge of facts. The successful men of our acquaintance are, generally speaking, neither learned nor men of great intellect. They are men, first of all possessed with an earnest purpose. They have a certain all-round poise or balance called common sense. They have acquired through long training those habits, both mental and physical, which make them masters over themselves; and at all times they have the firm determination to pay the price for success in hard work and self-denial.

It is singleness and earnestness of purpose that constitutes the great motive power back of most successful men, and it is a notable fact that the moment a young man becomes animated with such a purpose, that moment he ceases to believe in the elective system, and in the loose college discipline.

In all earnest enterprises which the students themselves manage, they throw the elective system to the winds and adopt methods and a discipline quite as rigid as those prevailing in the commercial and industrial world.

The boy who joins the foot-ball squad is given no sixty cuts a season, nor is he allowed to choose what he will do. He does just what some one else tells him to do, and does it at the time and in the manner he is told, and one or two lapses from training rules are sufficient cause for expulsion from the team or the crew.

I say in all seriousness that were it not for a certain trickiness and a low professional spirit which has come to be a part of the game, I should look upon foot-ball and the training received in athletics as one of the most useful elements in a college course, for two reasons: First, because in it they are actuated by a truly serious purpose; and second, because they are there given, not the elective idea of doing what they want to, but cooperation, and cooperation of the same general character which they will be called upon to practise in after life.

Is not the greatest problem in university life, then, how to animate the students with an earnest, logical purpose?

In facing this question I would call attention to one class of young men who are almost universally imbued with such a purpose; namely, those who, through necessity or otherwise, have come into close contact and direct competition with men working for a living. These young men acquire a truly earnest purpose. They see the reality of life, they have a strong foretaste of the struggle ahead of them, and they come to the university with a determination to get something practical from the college training which they can use later in their competition with men.

They are in great demand after graduating, and as a class make themselves useful almost from the day that they start in to work.

Neither their earnestness of purpose, however, nor their immediate usefulness, comes from any technical knowledge which they have acquired while working outside of the university, but rather from having early brought home to them the nature of the great problem they must face after graduating. Nothing but contact with work and actual competition with men struggling for a living will teach them this. It can not be theorized over or lectured upon, or taught in the school-workshop or laboratory.

I look upon this actual work and competition with men working for a living as of such great value in developing earnest-

ness of purpose that it would seem to me time well spent for each student, say, at the end of the freshman year, to be handed over by the university for a period of six months to some commercial, engineering or manufacturing establishment; there to work as an employee at whatever job is given him, either manual or other work. He should have the same hours and be under the same discipline as all other employees, and should receive no favors. Moreover, he should be obliged to stay even a longer time than six months unless he has in the meantime given satisfaction to his employers.

I believe that there would be but little difficulty in obtaining the cooperation of our business and manufacturing establishments in carrying out this plan, and the University of Pennsylvania, situated as it is in the foremost manufacturing city in this country, would have an especially good opportunity to inaugurate it.

My belief in the benefits to be derived from doing practical every-day work early in the college course is not the result of a theory. It is founded upon close observation and study of young men who have had this experience, and also upon a vivid remembrance of breakfasting each morning at five-thirty, and starting to sweep the floor of a pattern shop as an apprentice some thirty-two years ago, after having spent several years in preparing for Harvard College. The contrast between the two occupations was great, but I look back upon the first six months of my apprenticeship as a patternmaker as, on the whole, the most valuable part of my education. Not that I gained much knowledge during that time, nor did I ever become a very good patternmaker; but the awakening as to the reality and seriousness of life was complete, and, I believe, of great value.

Unfortunately, laboratory or even shop work in the university, useful as they are, do not serve at all the same purpose, since the young man is surrounded there by other students and professors, and lacks the actual competition of men working for a living. He does not learn at college that, on the whole, the ordinary mechanics, and even poorly educated workmen, are naturally about as smart as he is, and that his best way to rise above them lies in getting his mind more thoroughly trained than theirs, and in learning things they do not know. All of this should be taught him through six months' contact with workingmen.

Let me repeat in conclusion that our college graduates are the best picked body of men in the community. Yet I believe that it is possible to so train young men that they will be useful to their employers almost from the day that they leave college; so that they will be reasonably satisfied with their new work instead of discontented; and to place them upon graduating one or two years nearer success than they now are; and that this can best be accomplished by giving them an earnest purpose through six months' contact early in their college life with men working for a living; by rigidly prescribing a course of studies carefully and logically selected, and with some definite object in view, and by subjecting them to a discipline comparable with that adopted by the rest of the world.

Philadelphia possesses and is proud of the most notable group of medical schools in this country, and among these that of the University of Pennsylvania unquestionably stands first.

The Philadelphia lawyer has been proverbial for his knowledge and shrewdness for more than a century, and this reputation can be traced largely to the fundamental training given in the law school of the University of Pennsylvania.

Philadelphia is the center of the largest and most diversified group of engineering

and manufacturing enterprises in this country. The Engineering Schools of the University of Pennsylvania already stand high; but it seems to me that the opportunity lies open to them even more than to their famous medical and law schools to stand at the very top. This magnificent building, equipped as it is with the latest and best of everything, is the first and a great step towards this end. But, after all, your largest possibility and one which does not exist for, and can not be created by, any other American university, lies in the opportunity for bringing your students into close touch and personal contact with the men who are working in and managing the great industrial establishments of Philadelphia.

FREDERICK W. TAYLOR.

THE ENGINEER AS A CITIZEN.

I CONSIDER it no small honor to be included as one of the participants in to-day's program. But though I come on the invitation of those in authority, I hesitate to appear before this audience, gathered in sympathy with so notable a step in the development of one of the greatest of America's universities, a university presided over by a man eminent as an educator, an administrator, and a man of affairs, to express my opinions on questions of engineering education and citizenship and their correlation.

In spite of apprehensions as to my insufficiency for the duty I have accepted, I shall make no apology, but fall back upon the fact that, having been called to serve the university to which as an adopted son I proudly owe allegiance, it remained for me but to obey. I can only promise you that I shall not vaguely theorize, but I shall speak from my personal experiences in the fields of business, engineering and education.

In coming before you as the president of Stevens Institute of Technology, I come as the successor of your own Henry Morton, a graduate of, and later a professor in, your university, secretary of the Franklin Institute, professor in the Philadelphia Dental College, brilliant lecturer, profound scientist, man of affairs, but above all a simple-minded seeker after the truth, too modest to recognize his own great qualities of mind, qualities combining the grasp of genius with the sanity of common sense.

It is peculiarly appropriate that the University of Pennsylvania should develop a thoroughly efficient department of engineering education in view of the important scientific work done by the many-sided Franklin, upon whose suggestion the original Philadelphia Academy was organized.

In view of what I have in mind to say to-day, I am particularly struck by the following words which appear in the original charter granted to the academy in 1753 by Thomas and Richard Penn:

> **The well-being of a society depends on the education of their youth, as well as, in great measure, the eternal welfare of every individual, by impressing on their tender minds principles of morality and religion, instructing them in the several duties they owe to the society in which they live, and one towards another, giving them the knowledge of languages, and other parts of useful learning necessary thereto, *in order to render them serviceable in the several public stations to which they may be called.***

It is interesting to note that the charter of 1755, creating the college, enlarged the scope of work to include 'Not only the learned languages, but the liberal arts and sciences.'

Since Franklin's day, tremendous strides have been made in the sciences and especially of late years in that branch in which he did pioneer work—electricity.

It is to the credit of this university that it has recognized its responsibility in connection with this advance, and has quietly progressed in the line of engineering edu-

cation until to-day we are assembled to recognize formally the addition to its educational plant of a complete engineering building, probably second to none of its kind and equipped to give adequate instruction in several branches of engineering.

Should not this magnificent growth from so small a beginning strengthen our faith and be an encouragement to all of us who are struggling to meet our responsibilities along similar lines?

There is passing over the United States to-day a wave of reform—some of it real and honest—much of it not so. To-day reform is popular and to a certain point I am willing, yes anxious, to go with the popular party.

Reform is needed, much needed, in the United States and in many directions. And reform always has been needed and always will be needed in this world of ours. Here is where the first mistake is made by the reformers. Their proposition seems to be that the conditions now attracting their attention are singular.

The people at large have been deceived as to our condition in connection with the need of reform as compared with times past. Many men of standing hold the opinion and are willing to act on the belief that the present condition as to the wrongful use of the money power is such that relief can be found only through a revolutionary upheaval. If the case is so desperate that a surgical operation is required, let us hope that our republic will not be in the position of the unfortunate patient who dies under the knife, although the surgeon declares the operation to have been successful.

And what has been the chief agency in this deception? Unquestionably, yellow journalism.

Yellow journalism of the ordinary sensational type is an old story in America. Dickens shows us—perhaps the picture, caricature-like, is an exaggeration, but, caricature-like, it contains the elements of truth—that yellow journalism had a footing with us in the days of Martin Chuzzlewit and Mark Tapley. Comparatively, this type is harmless. But the extreme yellow journalism of to-day is something very different. We now have to face a systematic effort to deceive the people by a partial telling of the truth and an extended telling of untruth, with the deliberate intention of stirring up discontent and antagonism between classes.

Public opinion in connection with our form of government is a necessary safeguard of liberty. But to be a safeguard, it must be sane public opinion, and not public clamor instigated by a section of the press which is influential in spite of being conscienceless.

There are too many to-day who are willing to push aside their individual responsibility in this connection by relying, or pretending to rely, upon the good sense of the so-called plain people. But these yellow journals are sedulously and constantly engaged in the effort to corrupt this good sense.

Others tell us that our republic is safe in the hands of our young men. These are urged to take part in political movements and especially in movements looking to the betterment of civic conditions. Undoubtedly, if rightly employed, here is a powerful agency for good. But these young men must not be encouraged to believe that they are capable of helping the cause of good government simply because of their youth. As a rule inexperience and immaturity go with youth. If in our public affairs we need the fire and enthusiasm of youth, as we do, we also need thorough knowledge of facts, followed by their judicial application. Real reform must be based upon a careful, competent, honest

consideration of all obtainable evidence and data.

To-day, all over the land, we find indiscriminate abuse of corporations. What is fair and honest is condemned along with that which is unfair and dangerous to our national life. If we condemn indiscriminately and thus unjustly, so surely will there be a reaction, and public opinion, seeing that injustice has been done, will be carried to the other extreme and again become indifferent to real evils. And the last condition shall be worse than the first.

If wrong has been done under the mantle of trusts and corporations—and unquestionably such is the case—that is no reason that we should believe that corporations as such are necessarily evil in their work and influence. It is a commentary on the sincerity of some of the most blatant of yellow journalists that, while condemning corporations as a whole, they avail themselves of the protection to be found in corporate organization to secure immunity from personal responsibility.

And are we not forced to acknowledge, much as we may regret the necessity, that the yellow journals have been given their opportunity all too often through the hasty, intemperate, non-judicial utterances of those occupying the highest positions within the gift of the people? Are these men, occupying their high positions through the votes of the people who have trusted them, to be absolved from responsibility because they plead, or the plea is entered for them, that they are sincere in their beliefs, are personally honest in their acts and have effected reforms in spite of their indiscretions? They can not so escape their final responsibility.

It used to be thought that responsibility thrust upon an office-holder would steady him and make him a safer guide than his public utterances before election had seemed to warrant.

The effect of the present tendency to destructive criticism is to kill or at least discourage individual enterprise. National enterprise can result only from individual enterprise; and the latter necessarily is held in check and finally killed if the individuals come to believe that the government will not permit them to reap fairly where they have sown.

Much, perhaps nearly all, of the present unrest comes from lack of information and from misinformation as to the conduct of certain of our industries. The evils which flow from general lack of information are systematically cultivated by misinformation supplied by the worst of the yellow journals.

Then to-day the problem is—how shall we correct the false impressions created by those who systematically aim to deceive and by those who, while honest in intention, are not deterred from rash statements by their ignorance and inexperience?

First, we should be firm not to believe evil of any one or anything on the unsupported statements of the yellow press. Beyond that the remedy must come from the dissemination of the truth. The nation as a whole needs the honest services of those who know.

But it may be asked, why this discussion in connection with the dedication of a building to be devoted to engineering education? I will try to show in a few words that this discussion is appropriate to the occasion.

In this country the varied and bountiful gifts of nature have, in no small degree, been utilized for the common good through the efforts of the workers in pure and applied science. This country's present commanding position in the industrial field is, in considerable measure, due to the efficient preparatory work done by our engineering schools. And incidentally let me say, while all classes have, directly or indirectly, prof-

ited by the industrial prosperity of the nation, it is to be deplored that those who have acquired great wealth from industrial undertakings have *as a class* failed to show in a practical way their appreciation of their obligations to these institutions.

To whom should the public look for the facts concerning industrial undertakings? Certainly to those who are engaged in the work, who understand the underlying principles involved; who, knowing all the details and appreciating that part truth often serves to deceive, are honest enough to tell the truth, the whole truth and nothing but the truth.

During the last decade the management of our industries has been falling more and more into the hands of the men who have received a preliminary training in our engineering colleges. If this is to continue, it must be the graduates of our technical colleges to whom we must look more and more for protection from the evils to which I have referred. Questions are continually arising which can be settled only through expert advice. The people must come to have confidence in those who give these expert opinions. Unfortunately, the title 'expert' has been too often degraded by those who have assumed to speak as such. Too often our experts accept retainers to tell part only of the truth and possibly to cloud over, distort or deliberately hide other parts of the truth. Such expert advice brings discredit upon our profession and affords an opportunity which the enemy is not slow to seize.

Again, the so-called expert often errs through ignorance. It must come to be recognized within our own ranks that the fields of science and practise have so widened of late years that no man can honestly claim to be able to cover authoritatively more than a limited area of either of these fields.

There are a number of fairly well defined branches of engineering, such as civil, mechanical, mining, naval, electrical and chemical. But no one man can hope even to cover authoritatively every portion of any one of these branches. To be thoroughly efficient, the engineer must closely specialize within his profession. And yet we find public opinion on intricate and complex industrial questions based upon the dictum of men who have at the best but a general knowledge of the matters involved. Especially it is to be regretted that graduates of engineering colleges, possibly competent in some one branch of the great field of engineering, presume to instruct in connection with some other branch on which their knowledge is only of a general character.

But the technical adviser, be he scientist or engineer, to serve the state as I have indicated, must have more than a knowledge of material things, he must be honest to the core.

Education is a boon. It is well for a nation that its youth should be educated, as was argued by your Benjamin Franklin and his associates. But a little knowledge is a dangerous thing and much knowledge may be even more dangerous if not built on the foundation of character.

The engineer, to be an engineer in anything more than title, must be practical. His work must be based upon correct and complete theory, but it must be first and last practical. Can the engineer—that is, the civil engineer as distinguished from the military engineer—be practical, can he economically apply the truths of nature for the benefit and convenience of mankind; in other words, can he really be an engineer, unless he is competent to practise his profession within the necessary commercial limitations and in accordance with standard business methods? Can he disregard the question of return on investment? These questions, if fairly put,

answer themselves. But still there are engineers who seem to believe that engineering is something which can be practised without regard to money values and that others can be trusted to coordinate the engineering and commercial elements of the enterprises in which they are concerned. These men may be ingenious inventors or designers, they may be great mathematicians, they may even be eminent as scientists, but they are not engineers. The man who is willing to scientifically spend a dollar to save fifty cents can not be classed as an engineer nor can he be of much assistance in meeting the present yellow-journal danger. The man to so serve the cause of truth must be fully qualified to practise his profession in conformity with the limitations of commercial and industrial practise; to the knowledge and training gained in the school of engineering he must have added that knowledge and training which is to be gained only in the exacting school of experience.

Then the question is raised—what should the college education include that is not now generally covered in the regular four years' course? First it must be acknowledged that the courses in place of other material obsolete are crowded to the point where nothing more can safely be added unless there is a corresponding elimination. Through the steady and rapid advance in engineering science we are constantly having thrust upon our attention new matter for introduction into our courses. But where this new material can not advantageously be substituted as illustrations and applications of scientific truths in place of other material obsolete through displacement, the new must necessarily be refused admission. We must encourage ourselves in the reflection that our engineering courses are, after all, preliminary, and to a certain extent, elementary, and that it must in any case remain for each student after graduation to thoroughly learn all the details of some one—possibly narrow—branch of engineering or industrial operation. While every engineer-student should, after four years, have a good general knowledge of engineering science and practise and be thus prepared to acquire rapidly and surely a specific and certain control of some one branch of the profession, we must recognize that we can not graduate our men as fully equipped engineers, ready to assume positions of responsibility in any part of the engineering field. And are not the employers often at fault, even some of those who themselves are graduates in engineering, in expecting the young graduate to be able at once to do work which probably the employer himself was not qualified to do for years after his graduation? Is not too much expected of the modern education? There is no royal road to learning, there never will be, and no progress in educational methods will ever relieve the students from the hard work required for mental discipline and specific training. Should we not constantly bear in mind that the amount of work required in the four years should be limited to the capacity for thorough work by the eighty per cent. student?

How, then, with the four years already crowded, are we to find time to give our students some preparatory training in the branches required to enable them to take up their work in conformity with commercial requirements? First let us see if we can agree with Huxley that "The great end of life is not knowledge but action. What men need is as much knowledge as they can assimilate and organize into a basis for action; give them more and it may be injurious." Is it not probable that in certain directions we are giving our students more than they are yet prepared to assimilate and organize as a basis for action? Should they not be subjected to a

well-balanced course? Should they not then at least be taught the necessity for practising in conformity with commercial limitations and methods?

I contend that every engineer-student should have some instruction in the principles of accounting, in depreciation, business law, patent law, banking, specification, and even of sociology. And in connection with the business side of their training they should be made to see the importance of the correct use of language. They should be given opportunities to see how the work of the world is impeded and hindered through the ambiguous expression of thought. They should be taught that it is not enough to know, but that they must be able to give effect to their knowledge through the use of correct, clear, explicit and forcible language. More particularly in this business department they should be warned by those who can speak from experience of the pitfalls into which they are liable to fall and especially through the efforts that probably will be made to purchase their professional opinions if these opinions prove to be of value. Here, as in no other department, can the ethics of the profession be impressed upon the young engineer-student. As religious instruction is excluded from engineering courses, it is all the more incumbent upon us to show our students the lines along which they should practise if they wish to maintain their self-respect.

Some authorities oppose the broadening of our schemes of instruction on the score that necessarily the effect must be to make them less specific and more superficial. Others oppose making the courses more technically specific on the score that necessarily the effect must be to narrow them. I venture to maintain that the change I recommend would broaden the instruction and also make it more thorough and more specifically adapted to the needs of the engineer-student. To reach this result the selection of matter for elimination must be made with the utmost care, keeping constantly in view the work for which the engineer-student is being specifically trained and that we are not only giving him knowledge but we are training him to think straight and that it will remain for him to acquire in the school of experience that additional training in application which can not be obtained elsewhere.

In this university you are already equipped as few educational institutions are to supplement as I have suggested the studies more directly concerned in the technical side of engineering. I refer to the Wharton School of Finance and Commerce.

Even if only one hour a week during the junior and senior years could be devoted to these economic subjects, the students would be better prepared to go out into the industrial world to promptly equip themselves to take authoritative positions, positions from which they could do much to counteract the danger arising from the indiscriminate condemnation by yellow journals of the results obtained from the combination of capital and individual enterprise working under corporate organization. Even if, with the time saved by elimination of studies of less comparative value, we could only give our students before their graduation a keen appreciation of their need of the class of knowledge I have referred to, the time would be well spent.

This is an industrial nation and the people should therefore have the opportunities to learn the truth as to the fundamentals of industrial management, and the lawmakers should have the opportunities to learn the special conditions, local and otherwise, affecting each branch of industry. This information must come from those who, knowing the truth, are willing to place it before the public. The public must first

have confidence in the ability and integrity of their informants, and here it becomes the duty of our technical colleges to train their students to take the positions in the world of industry which will qualify them in their several stations to fully serve their country as fountains of truth.

In conclusion, let me quote a passage from an address by that ardent champion of truth, Thomas Huxley, delivered in 1880, upon a somewhat similar occasion to the present, namely, the opening of the Technical College in Leeds.

> * * * It is not beside the mark to remind you, that the prosperity of industry depends not merely upon the improvement of manufacturing processes, not merely upon the ennobling of the individual character, but upon the third condition, namely, a clear understanding of the conditions of social life on the part of both the capitalist and the operative, and their agreement upon common principles of social action. They must learn that social phenomena are as much the expression of natural laws as any others; that no social arrangements can be permanent unless they harmonize with the requirements of social statics and dynamics; and that, in the nature of things, there is an arbiter whose decisions execute themselves.
>
> But this knowledge is only to be obtained by the application of the methods of investigation adopted in physical researches to the investigation of the phenomena of society. Hence, I confess, I should like to see one addition made to the excellent scheme of education propounded for the college, in the shape of provision for teaching sociology. For though we are all agreed that party politics are to have no place in the instruction of the college; yet in this country, practically governed as it is now by universal suffrage, every man who does his duty must exercise political functions. And, if the evils which are inseparable from the good of political liberty are to be checked, if the perpetual oscillations of nations between anarchy and despotism is to be replaced by the steady march of self-restraining freedom, it will be because men will gradually bring themselves to deal with political, as they now deal with scientific, questions; to be as ashamed of undue haste and partisan prejudice in the one case as in the other; and to believe that the machinery of society is at least as delicate as that of the spinning-jenny, and as little likely to be improved by the meddling of those who have not taken the trouble to master the principles of its action.

ALEX. C. HUMPHREYS.

SCIENTIFIC BOOKS.

Entomology, with Special Reference to its Biological and Economic Aspects. By JUSTUS WATSON FOLSOM, Sc.D., Instructor in Entomology in the University of Illinois. Philadelphia, P. Blakiston's Son and Co. 1906. $3.00.

There is supposed to be a growing demand for a biological treatment of entomology, and two notable efforts have recently been made to meet it. Professor Kellogg met it in his 'American Insects' by adding to the systematic treatment of the older standard texts (which he incorporated *in toto*) a few chapters on color, insects and flowers, insects and disease, etc., making a very big book of the encyclopedic sort. Dr. Folsom has followed the plan of cutting down to an almost negligible quantity the systematic part, giving a condensed résumé of anatomy, physiology and embryology, and devoting the greater part of his book to the discussion of general biological phenomena, making it a reading book of comfortable size. Thirteen pages of systematic description of the orders serve to eliminate that part of the subject (which, according to the preface, is thus summarily dealt with because of its prominence in other available texts). The condensation is at its maximum in the description of the larvæ of the orders, for which purpose two words, *thysanuriform* and *eruciform*, suffice. The theoretical significance of these terms is explained in the chapter on development: but here in the descriptive part they are very much over-worked. To say merely that the larvæ of the Odonata are thysanuriform is certainly not very illuminating. Only with the mind's eye could one see, for instance, anything thysanuriform in the larva of *Hagenius*.

The chapters on morphology and development (158 pages) are concise, well digested and altogether excellent, and taken in connection with the well-selected bibliography at the

end of the book, furnish a good introduction to these subjects.

Then follow the chapters embodying the 'biological treatment' comprising the greater part of the text (183 pages). Their titles are the following: Adaptations of Aquatic Insects, Color and Coloration, Adaptive Coloring, Origin of Adaptations and of Species, Insects in Relation to Plants, Insects in Relation to Other Animals, Interrelations of Insects, and Insect Behavior. While these subjects are not new to entomological text-books, they are here given a new treatment and merited prominence, and entomologists will appreciate having them brought together for discussion in one place.

Then follow chapters on Distribution, and on Insects in Relation to Man, the latter being a discussion of the mission of the economic entomologist and a historical sketch of the evolution of that species in America. The economic entomology of the book is mostly in the title, where it, perhaps, serves the publisher's purpose. There is no mention of many of the most important economic species, nor of the most important methods of economic procedure. The book concludes with a good bibliography, of 57 pages.

The typography and press work are excellent. Mistakes are few; but in the short chapter on adaptations in aquatic insects the following are noted: The figure of the hind leg of the diving beetle *Cybister* on page 187 fails to show the inferior spur greatly widened—the character by which this genus is most readily recognized; the figure of *Simulium* larva on page 190 does not show the anal gill tuft, although illustrating a paragraph on gills; it is doubtless by oversight that the larvæ of Ephemeridæ are mentioned on the same page along with those of the Odonata as having a highly developed rectal respiration. The style is never prolix, and although verbal infelicities are rather too frequent, the meaning is rarely obscure. The illustrations are always appropriate, and generally of a high order. The book as a whole is excellent, and will be most useful to the general student.

J. G. N.

The Elements of Geology. By William Harmon Norton. Ginn and Co. 1905.

This volume has been written, the author tells us, to fill the need of a text-book that shall knit cause and consequence in geology together, 'to treat land forms and rock structures in connection with the geologic processes causing them,' abandoning the traditional division of the subject into departments, dynamical, structural, physiographical and historical. As a matter of fact, he preserves the last of these, so the new departure must be looked for in the rest of his book, 'External Geological Agencies and Internal Geological Agencies.' We readily obtain an idea of the treatment attempted by comparing Professor Norton's book with a well-known predecessor. For this I have put equivalent parts of LeConte's text-book and this on the same lines of parallel columns. It thus appears that our author has omitted the 'Structural Geology' and some of the 'Organic Agencies' and put the rest under slightly different heads:

Norton.	LeConte.
I. External Geological Agencies.	I. Dynamical Geology.
	1. Atmospheric Agencies.
	2. Aqueous Agencies.
	3. Igneous Agencies.
	4. Organic Agencies.
II. Internal Geological Agencies. (Touched in I.) (Touched in I. and II.)	II. Structural Geology.
III. Historical Geology.	III. Historical Geology.

Of LeConte's organic agencies, peat is described by Norton under river deposits, lime accumulations under offshore and deep sea deposits, and the bog ore, silicious and phosphatic deposits that get a brief mention in LeConte are not here referred to.

Of the structural geology, general form and structure of the earth are omitted as far as I have been able to learn, sedimentary rocks are treated in several places, one half page in the Introduction, five pages in the Work of the Weather, twenty pages in Offshore and Deep-sea Deposits, six pages in River Deposits and about three pages in the Work of the Wind. Igneous and metamorphic rocks are treated under internal agencies, joints under the work of the weather and movements of the earth's crust, faults under movements of the earth's crust, mineral veins under work of ground water and metamorphism and mineral veins,

while denudation comes under rivers and valleys. In general the chief novelty has been the omission of structures as a separate group. The result is separations as well as connections. We learn of river deposits in connection with the study of rivers as agents, but to learn about sandstones we must go to three or four separate parts of the book. If there are gains there are losses to set over against them.

From the reviewer's point of view this is a very beautifully illustrated volume in which physiography is unusually prominent. Omit the historical third part, the weakest part of the book, and add a little here and there about man, plants and animals and the book would fall perfectly into a class of recent text-books of physical geography, all with some general similarity to Davis's 'Physical Geography,' but lacking its classification and evolution of the forms of the earth's surface. The physiographic half-tones are mostly very beautiful both in appearance and in teaching value. 'A Lake well-nigh effaced, Montana' and 'A level Meadow, Scotland,' pages 71 and 72, seem to me unsurpassed as illustrations. All localities are rather vaguely referred to as here, though it is hard to see why. Professor Norton evidently knows where these places are and students would certainly find some interest in sharing his knowledge. There are practically no references to other books, either. The presswork is of course admirable, though a beginner will wonder at a 'parted laver' (p. 217). The diagrams are less satisfactory, some of them stiff and difficult to read. The map of Niagara gorge at page 60 has evidently been copied from Gilbert's paper in the National Geographic monographs though it is not so credited. Unfortunately, it has been redrawn and badly redrawn, so that it quite conceals the variations in width that are very marked in the original and afford even better evidence of varying erosion by the river than the depth of the gorge does, as Taylor has shown. A similar thing appears to have been done with the cut of the silurian scorpion at page 339. It strongly suggests the woodcut figured 347 in Geikie's manual, but redrawn with the omission of the artist's name, which in Geikie shows very plainly. There is no acknowledgment to any one, though about one third of the cuts are acknowledged borrowed, a dozen from the author! Most of the illustrations in the 'Historical Geology' have a familiar look. Dana and Geikie come quickly to mind at sight of figures 331, 338, 339 and 336. None of them, however, are credited.

The historical part does not seem to have received so much of the author's attention as the earlier portions of the book, nor even so much attention as its importance merits. This undertreatment disappears when we come to the Quaternary and the Ice Age. The physiographic is everywhere the part best developed. In matters of fact the work seems painstakingly accurate. That it is somewhat dogmatic is, perhaps, pardonable in an elementary text-book. Yet, if alternative views had been stated occasionally it would help the student avoid the 'common error' referred to by Professor Davis in his godfatherly note, of thinking 'authorities' have a private road to information. Thus 'lateral secretion' appears to be the only view of the origin of mineral veins that Professor Norton cares to entertain. For him Posepny does not exist, nor waters from the depths. Yet Professor Gregory has just been returning from Australia, stating that the so-called artesian waters of New South Wales are all deep waters soon to be exhausted. At page 331 Professor Norton calls the waters artesian that ascend in borings after gas has given out! There is no doubt that many teachers could find this volume helpful in giving students interest in earth science without necessarily appreciating at the author's estimate the particular need he has sought to fill.

MARK S. W. JEFFERSON.

YPSILANTI, MICH.,
October 17, 1906.

SCIENTIFIC JOURNALS AND ARTICLES.

The Botanical Gazette for October contains the following leading articles: George F. Atkinson gives a detailed account of the development of *Agaricus campestris*, illustrated by six photographic plates. William Crocker publishes the results of an investigation of

delayed germination of seeds, discovering that the cause generally lies in the seed coats, rather than in the embryos. In the case of the well-known 'upper seed' of the cocklebur, it is found that the delay is secured by the seed coat excluding oxygen; while in many seeds it is secured by the coats excluding water. John Donnell Smith publishes his twenty-eighth paper entitled 'Undescribed Plants from Guatemala and Other Central American Republics.' Clayton O. Smith describes with the aid of half-tone illustrations a bacterial disease of Oleander occurring on young Oleanders in California, which proves to be the same disease that causes knot-like growths on the olive.

The November *Journal of Nervous and Mental Disease* opens with a discussion of the cerebral element in the reflexes and its relation to the spinal element by Dr. G. L. Walton and Dr. W. E. Paul. Dr. Wharton Sinkler contributes the report of a case of Landry's paralysis with the unusual result of recovery, and Dr. Morton Prince gives an account of a case of brain tumor characterized by a circumscribed limited area of anesthesia, marked muscular atrophy appearing early, epileptiform attacks of hemialgesia of a peculiar nature; loss of the muscular sense, astereognosis, ataxis and paresis, increasing to ultimate paralysis. A study by Dr. Harvey Cushing of sexual infantilism with optic atrophy in cases of tumor affecting the hypophysis cerebri completes this part of the number.

DISCUSSION AND CORRESPONDENCE.

A DEFINITION OF FLUID.

In discussing Professor Elihu Thomson's paper on vulcanism Dr. Alfred C. Lane[1] asks: "Are we clear as to where we are to draw the line between viscous fluid and solid?" and he then gives a definition of fluid which is certainly an improvement on the old description of a fluid as a substance which will conform to the shape of the containing vessel and will present a level upper surface.

Dr. Lane's definition, however, does not answer the question: Where shall the line between solid and fluid be drawn? He cites molasses candy and tar as bodies which apparently are solids but which really are fluids; but he takes no account of the fact that it is changing conditions external to matter which determine the appearance and disappearance of many of its physical and chemical properties. At the temperature of liquid air both molasses candy and tar would lose the property of highly viscous fluidity, which they assume under the ordinary conditions whereunder we have become familiar with them, and would acquire a rigidity which would make them solids in the most approved sense. The place to draw the line between solid and fluid is at the junction of conditions which determine the supercession of the solid by the fluid state. This point was long ago recognized as a physical constant of matter and has received a name—plastic yield-point. This point, like melting-point, boiling-point and simple gas-point, separates two of the phases or states of aggregation through which matter passes in the course of its transformation from the highest to the lowest degree of polymerization.

Plastic yield-point, like melting-point and boiling-point, is a function of both temperature and pressure, and can, therefore, be represented graphically by a curve drawn with reference to temperature and pressure as rectangular coordinates. Under conditions fixed by a point on the curve of its plastic yield-point, a substance is on the dividing line between its solid and fluid phases. An increase of either temperature or pressure would (if a path be open) occasion molecular shearing—that is, differential motion between *molecules*—at any point in the mass. A decrease of either temperature or pressure would place the substance under conditions represented by the area on the other side of the curve, where the intermolecular locking is strong enough sensibly to resist (within the time considered) the force tending to make the molecules glide over one another; this is the distinctive property of solids. For all purposes of mechanics, including cases arising in dynamic geology, a fluid may be described as matter exposed to conditions which place it in the region beyond

[1] Science, N. S., Vol. XXIV., No. 613, p. 404.

the curve of its plastic yield-point in the direction of increasing temperature or pressure.

As to the internal constitutive differences which distinguish the fluid from the liquid state much remains to be learned, but it is regarded as probable that these differences are to a large extent grounded in a difference in molecular complexity; fluid and liquid doubtless bear to one another the same relation as vapor and gas, which usually always differ in molecular weight. Thus, sulphur vapor at 445° C. has the molecular formula S_8; as the temperature of this vapor is raised, the complex molecule S_8 undergoes a disintegration and finally becomes S_2, which is not broken up until the temperature has become very high. At a point which we may call the simple gas-point the complex molecules of the vapor phase give place to the simple molecules of the gas phase. Both boiling-point and simple gas-point vary with the temperature and pressure, and hence both may be represented graphically by curves. The vapor phase or condition will lie between these two curves, and such a phase is common to practically all substances that can be boiled.

Now when a solid is heated under atmospheric pressure it first softens and then melts; and this intermediate stage of softening, when the substance is neither solid nor liquid, is properly the fluid phase or state, comparable to the vapor phase which is intermediate between liquid and gas. It can hardly be doubted that in the solid phase the molecular weight is the largest possible. When the yield-point is attained, these large molecules just begin to break up into smaller units and this process is continued until the melting point is reached and the substance becomes a liquid; in this condition the molecular complexes are very stable, and, like the simple gas molecules, generally require large additions of energy to undergo further change.

OSWIN W. WILLCOX.

SANDY HOOK PROVING GROUND,
FORT HANCOCK, N. J.

WHY DO HERRING GULLS KILL THEIR YOUNG?

EARLY last July I was making for the Public Museum of Milwaukee a photographically recorded study of the actions of a colony of herring gulls covering Gravel Island, a little islet at the upper end of the Door County peninsula of Wisconsin. At the time of my visit the young of the year were mostly about half grown and usually kept by themselves in a flock of several hundred. There were always a few young scattered among the adults on the island, but the great majority were at all times to be found in the flock, which seemed to have taken to itself a definite habitat at one part of the islet.

The island is, I am told, visited with some degree of frequency by pleasure-seekers, though as it is fairly remote from any resort I do not fancy that these visits are very numerous in any one nesting season.

When first visiting the island I rowed out to it with two companions, pitched my tent in the center of the island and disappeared within, after which my companions returned to the boat and rowed away. I have reason to believe that my remaining among the gulls was not suspected by them. From various observations I am convinced that the individualities of the young were so hopelessly lost in the flock that they neither knew nor were known by their parents.

Almost from the beginning of my observations and continuing intermittently all through them I was witness of numerous attacks committed by adults upon the young, in which the latter were so severely wounded that death did or in a short time would ensue. At the time of my arrival this year and also when I visited the same colony a year ago the island was strewn with the bodies of some dozens of these half-grown gulls bearing evidence of having been similarly done to death.

Usually when my attention was attracted to the enactment of one of these tragedies the victim was a bird to which I had paid no previous attention; but there were several instances where the young had been under fairly close observation for some hours previous. In no instance could I see that the young was weak, sickly or in any way abnormal, nor that it had given offense for which it was being punished. Sometimes when the flock of young was on the water near the

island an adult would approach and seize a young on the outskirts of the flock. At other times attacks would be made on young just coming up the beach from the water, while several times those that for some hours had been unmolested near the center of the island were apparently without provocation set upon and left in a dying condition. The main point of attack was the back of the head. To this region a number of severe blows were given with the point of the bill, after which it was grasped between the mandibles of the adult and the bird was pulled about until the skin and flesh were cut through to the skull. Sometimes the young fell on its back with feet convulsively kicking in the air. In this position the carpal joint of the wing and the breast seemed to be the points at which blows were mainly aimed. If the young escaped by running or was left apparently lifeless but subsequently revived and made off during the absence of its persecutor it was at once attacked by any other adult that happened to be near.

I am unable to convince myself that this destruction of their young was due to molestation of the colony, as has been suggested to me, but I have no other explanation to offer, unless it be impatience at the toll of regurgitated fish that the young levy upon the old.

I wish to inquire whether this murderous action on the part of the herring gull or of other birds has been noted in other colonies and whether any plausible explanation of it can be given. HENRY L. WARD.

PUBLIC MUSEUM, MILWAUKEE.

AN UNUSUAL METEOR.

TO THE EDITOR OF SCIENCE: In connection with the sinuous trail left by the meteor described by E. E. Davis in your issue for August 3 and discussed by Professor Abbe in that for September 14, I might remark that a similar phenomenon was seen and sketched in the case of a fine meteor seen in Ontario on July 5, 1898, a full account of which is to be found in the *Transactions* of the Astronomical and Physical Society of Toronto for 1898, page 74. C. A. CHANT.

TORONTO, October 16, 1906.

A CORRECTION.

MR. BASSLER, of the U. S. National Museum, has called my attention to a serious error of mine on page 1,209, foot-note, of the Thirtieth Annual Report of the Indiana Department of Geology and Natural Resources. In discussing two species of corals, *Cystelasma rugosum* and *C. quinqueseptatum* Ulrich, figured and named, but without formal descriptions, by Mr. Ulrich in Professional Paper 36 of the United States Geological Survey, the foot-note states: 'These specimens are neither described nor do they have the internal structure shown.' The statement refers to both species instead of *C. rugosum*. It was intended to apply to *C. rugosum* but not to *C. quinqueseptatum*. As it is the statement is untrue, as the internal structure of *C. quinqueseptatum* is clearly and accurately shown in Mr. Ulrich's figures. This is a reflection upon Mr. Ulrich which was not intended and for which I wish to apologize.

The great accuracy with which Mr. Ulrich portrays the characters observed and his unusual powers of discrimination are well known and I would be the last one to question them, especially when I had not examined the specimens figured, as was the case in this instance. Printed slips will be sent to all those receiving copies of the separates of the paper ('Fauna of the Salem Limestone of Southern Indiana') in which the error occurs. Inasmuch as it is impossible to reach all those receiving the bound volumes, it will be a favor if those having them will note the correction in the book.

J. W. BEEDE.

SPECIAL ARTICLES.

A NEW ARTEMIA AND ITS LIFE CONDITIONS.

THE classic observations and experiments of Schmankewitsch thirty years ago on the *Artemias* of certain salt pools near Odessa (Russia) clothe this curious phyllopod genus with a peculiar interest to zoologists and to students of species-forming. This interest has been renewed by the occasional reconsideration of Schmankewitch's data, and more rarely by the actual reexamination of *Artemia*

individuals under different environmental conditions (primarily the varying density or salt concentration of the waters in which the creatures live). In 1898 Anikin determined, to his own satisfaction at least, that the structural changes induced in *Artemia* individuals of succeeding generations by rearing these generations in salt water of differing density were not true species differences, fixed and heritable, but simply ontogenetic differences maintained only as long as the particular inducing influences (denser or less dense salt water) persisted. Certain specific characters, particularly those of the male, did not change at all, so that Anikin believed himself to be able still to recognize his original species throughout all the generations grown under modified conditions, although the species was actually plainly modified in structure in certain particulars. These structural changes, however, he found could be avoided if the changes in environment were made very gradually. When made violently the changes were marked, and could perhaps be interpreted to be those of degenerative or arrestative modification. In other words, the rearing of young in a salt water of higher concentration than that normal to the species worked injury or arrestation in the development. These modifications as noted by both Schmankewitsch and Anikin were chiefly concerned with the segmenting of the abdomen and the length and hairiness of the caudal appendages. As differences in exactly these characters were those by which the European species of *Artemia* (and partly the genus *Branchipus*) were distinguished, it is not surprising that Schmankewitsch believed himself to see *Artemia salina* transform into *A. milhausenii*, and *vice versa;* and even the genus *Artemia* change to the genus *Branchipus*. However, the correct interpretation of the affair is, probably, that the original describers of the European species had before them various 'ontogenetic species' of *Artemia, i. e.,* nutritional or developmental varieties.

In America three species of *Artemia* have been recognized; one *A. gracilis* Verrill, from barrels or casks of salt marsh water exposed (and hence much denser than the original marsh water) on a railroad bridge near New Haven, Conn.; another, *A. fertilis* Verrill, from Great Salt Lake, and the third, *A. monica* Verrill, from Mono Lake, Cal., a strongly salt and alkaline lake in the Owens River desert. All of these *Artemias* are living in salt water of a density much greater than that of ordinary sea water. The water in the New Haven casks varied in density from 1.06 to 1.065; the water in Great Salt Lake has a density of 1.17 and that in Mono Lake is certainly not less dense and is "so alkaline that it is said to be used for removing grease from clothing. It is said to contain, also, biborate of soda." I know of no experiments with the American *Artemias* except that Verrill states that *A. gracilis* 'can exist without apparent inconvenience when the water in which they occur is diluted with an equal bulk of fresh water as well as when it is much concentrated by evaporation.'

To the short list of American species I have to add a new one collected by student David Fulloway from the evaporating pools of a salt works at Redwood City (five miles from Stanford University) on the west shore of San Francisco Bay. This west coast *Artemia* differs markedly from the other American species in those characteristics upon which Verrill relies to distinguish the already known American forms, viz., the shape of the male claspers, the female egg-sac, and the character of the caudal appendages. The character of size upon which Verrill seems to have placed some reliance is a frail support, for it gives way when individuals reared under different conditions (density of salt water) are compared. The new species may be named and described as follows:

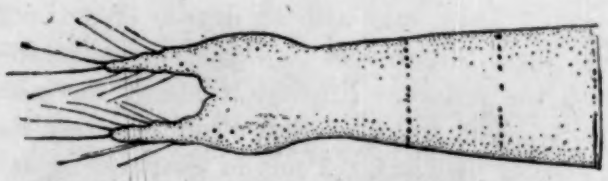

FIG. 1. Posterior tip of abdomen, showing caudal appendages of male *Artemia franciscana*, n. sp.

FIG. 2. Front aspect of head of male *Artemia franciscana*, n. sp., showing eyes, antennæ and claspers.

Artemia franciscana n. sp. (Figs. 1 and 2). Body slender; length of mature females (with eggs) from 6 mm. to 13 mm., males 5 mm. to 8.5 mm.; color translucent whitish to dull brick-red; claspers of male with stout median part and elongate, regularly tapering acute-angled terminal part; the suture between second and third segments is wholly lacking (this condition practically breaking down the distinction between the genus *Artemia* and the genus *Branchipus*), and there is no indication by external angle or change in direction of the outer or inner margins to indicate the point of fusion of these two segments (Fig. 1); egg-sac of female as broad as long; caudal appendages longer than broad, longer than in any of the other three known American species, and with scattered hairs all along both sides of each appendage (this character also tends to approach the condition in *Branchipus*). This species in a way serves to connect the genera *Branchipus* and *Artemia* but in all its general habitus and in the shape (very characteristic) of the claspers of the male it is much nearer the described *Artemia* forms than the *Branchipus* type. Males, females, eggs and larval stages found abundantly in the salterns (evaporating pools), density 1.08 to 1.24, at Redwood City, San Francisco Bay, in September, 1906.

As mentioned in the species description, mature specimens, both males and females, of this *Artemia* vary markedly in size and coloration. They vary also in degree of activity. All these differences are plainly correlated with the different life-conditions of the creatures. The water of San Francisco Bay has a density of 1.024. Pools of evaporating salt solution of the following densities were examined: 1.06, 1.085, 1.11, 1.137, 1.187, 1.19, 1.20, 1.207, 1.23, 1.24. Beyond this density the salt is precipitating rapidly. *Artemias* occur in all these pools from 1.08 on, most abundant, largest and most active, however, in water of 1.11 and 1.13. In water of less density than 1.11 the *Artemias* are large but not so abundant; in water of greater density they are noticeably smaller, and in the densities of 1.20 and upward they are much smaller and much less active. The color variation is also associated with the density, both males and females in the denser pools being reddish, the females alone reddish in the waters of medium density, and both males and females translucent whitish in the pools of 1.085, 1.11 and 1.137. In water of 1.24 (in which the salt is precipitating slowly) there are not many *Artemias* and they are all reddish, very small and noticeably inactive.

With special reference to the differences which Schmankewitsch and Anikin found among individuals of *Artemia salina* grown in salt solutions of various densities I may confine myself, at present (pending the outcome of more systematic observation and experimentation), to the statement that differences in proportional length of post-abdomen to rest of body, in character of the abdominal segmentation and in length and hairiness of the caudal appendages are apparent in this new *Artemia* and evidently bear a definite relation to the different densities of the pools in which the *Artemias* are living.

VERNON L. KELLOGG.
STANFORD UNIVERSITY, CALIF.

SOME UNUSUAL NEW JERSEY FISHES.

DURING the past summer Mr. Wm. J. Fox was located at Sea Isle City, N. J., and observed or obtained the following species: *Lamna cornubica, Galeocerdo tigrinus, Myliobatis freminvillii, Clupanodon oglinum, Lucania parva, Tylosurus raphidoma, Hemiramphus brasiliensis, Albacora thynnus, Seriola lalandi, Blepharichthys crinitus, Vomer setapinnis, Palinurichthys perciformis, Bairdiella chrysura, Chætodipterus faber, Pomacanthus arcuatus, Balistes carolinensis, Alutera schœpfii* and *Echeneis alba-cauda*. A fine example of *Istiophorus nigricans* was also secured. *Stephanolepis hispidus* and *Ortho-*

pristis chrysopterus were taken at Palermo, in Cape May County, by Mr. George Z. Hartman, and at Cape May Mr. H. Walker Hand reports *Lagodon rhomboides* and *Limanda ferruginea*.

HENRY W. FOWLER.
ACADEMY OF NATURAL SCIENCES OF PHILA.

QUOTATIONS.

'BOTANY IN ENGLAND.'

PROFESSOR F. W. OLIVER'S presidential address to the botanical section of the British Association consisted of two parts, one dealing with 'The Seed, a Chapter in Evolution,' the other with 'Botany in England.' With the former we do not propose to deal; but the latter raises so many points for discussion that we can not but wonder that Professor Oliver selected for its delivery an opportunity when discussion was impossible. Although headed 'Botany in England,' it is mainly occupied with an attack upon the two great public herbaria—which, in Professor Oliver's opinion,'stand apart from the ordinary botanical current,' and must consequently 'languish' or suffer 'atrophy through disuse.'

Professor Oliver's style is not easy to follow, and we sometimes find it difficult to grasp his meaning. We propose, however, to offer a few remarks upon some of his statements, premising that we do not admit his claim to act as a judge in matters with which it is abundantly evident he is but imperfectly acquainted.

Having given a very brief sketch of what he considers 'the prevailing school of botany,' Professor Oliver proceeds to inform us that it 'has arisen very independently of that which preceded it.' Here we must at once join issue with him. He continues: 'All through the middle parts of the last century we were so busy amassing and classifying plants that the great questions of botanical policy were left to solve themselves.' Yet this period included the morphological work of Robert Brown, Lindley and Sir Joseph Hooker, not to mention that of Carruthers and W. C. Williamson, who were largely instrumental in establishing the science of paleobotany, and without whose work the first part of Professor Oliver's address would hardly have been written. In view of the above references, can it be said with any degree of accuracy that 'the prevailing school of botany has arisen very independently of that which preceded it?'

Professor Oliver continues:

> Great herbaria became of the order of things; they received government recognition, and they continue their work apart. Those who built up these great collections neglected to convince the schools of the importance of training a generation of botanists that would use them. The schools were free, and they have gone their own way, and that way does not lie in the direction of the systematic botany of the herbarium. So long as this tendency prevails, the herbaria must languish. When I say languish, I do not mean that they will suffer from inefficient administration—their efficiency probably has never been greater than at the present time. But the effort involved in their construction and up-keep is altogether disproportionate to any service to which they are put. * * * If things are left to take their course there is the fear of atrophy through disuse.

It is not easy to understand what Professor Oliver means in the first portion of this paragraph. The main function of 'the schools,' as it appears to us, is not to train a generation of botanists to use herbaria, but to impart a general knowledge of the subject which will enable the student to follow up any line which may have a special attraction for him, including, of course, systematic botany. But the flourishing existence of herbaria depends very little upon 'the schools.' The students of botany both at the British Museum and at Kew are sufficiently numerous to show that Professor Oliver's fear of 'atrophy through disuse' is groundless, although according to him these herbaria 'stand apart from the ordinary botanical current.' Whatever may have been 'the effort involved in their construction,' it is a thing of the past, and its proportion or disproportion to the 'service to which they are put' can not be discussed: their 'efficiency,' he admits, was 'never greater than at present.' It may be that besides the 'ordinary botanical current' with which Professor Oliver is acquainted, there is another of whose course he is ignorant.

Having, however, satisfied himself that the 'general position of systematic botany' re-

quires 'alleviation,' and that atrophy is imminent, the professor proceeds to 'attempt an analysis of some of the causes which have led to this condition of affairs.' Neither the British Museum nor Kew "has any connection, direct or indirect, with any university organization; there are no facilities for teaching; there are no students; no machinery exists for training recruits or for interesting anybody in the ideals and methods of systematic botany." If by this Professor Oliver means that herbaria are not teaching bodies in the sense that a university is, he is accurate enough; but when he proceeds to argue as a consequence that there are no means for interesting folk in systematic botany, he evidently speaks in ignorance of what can be and is being done. As regards the national herbarium, of which we are in a position to speak, it would not be difficult to find systematists of European reputation who would acknowledge with gratitude the help they have received in acquiring a knowledge of 'the ideals and methods of systematic botany'; and we have no doubt that similar testimony could be given at Kew. To take one example from each—Mrs. Gepp, who has a world-wide reputation as an algologist, owes her position to the 'ideals and methods' acquired as a student in the department of botany; Mr. Hiern, whose monograph of Ebenaceæ (1873) was but the first of a long series of contributions to systematic botany, first became 'interested' at Kew, and has since, at both herbaria, availed himself of the 'facilities'—for learning if not for teaching—which they afford.

Professor Oliver then goes on to suggest "another way in which a great economy could be effected in effort, time and money; this is the transfer of the collections and staff of the botanical department from the Museum to Kew. This is a very old proposal, first seriously entertained some fifty years ago after the death of Robert Brown." It may be remarked *en passant* that this 'old proposal' was first made in the course of Brown's own evidence before the Royal Commission on the British Museum in 1848, and rebutted by him (Q. 3468–9). "There must," he continues, "be endless files of reports and blue books in official pigeon-holes dealing with this question." This, of course, is pure hypothesis. "The most recent report of a departmental committee is known to all interested in the matter. From the character of the evidence tendered it is not surprising that no action has been taken." Professor Oliver must know that the 'evidence' was tendered by men of qualifications at least equal to his own—men, moreover, acquainted, as he manifestly is not, with the work and functions of a herbarium; and that if 'no action was taken' it was because none seemed desirable. This, however, does not prevent an *ipse dixit* which at any rate shows that the professor will allow no undue modesty to hinder the expression of his opinion: 'I am at a loss to find any adequate reason for the maintenance of two separate herbaria.' We have no intention of entering upon a discussion of the matter; suffice it to say that those best acquainted with both collections have long been of the contrary opinion, and that that opinion is strengthened as their knowledge increases. We note that in contemplating the fusion, Professor Oliver assumes that this would be done by the transfer of the museum collections to Kew; but his acquaintance with the report of the departmental committee to which reference has been made will have shown him that the reverse process has been advocated, and in view of his hope for an alliance of the herbarium officials with a 'local university,' it would seem a more reasonable plan.

It is clear from the whole tenor of his remarks that Professor Oliver is unacquainted with the functions or the value of public herbaria, and it is only when we recognize this that his position becomes intelligible. His ignorance is the more remarkable considering the eminent position as a systematic botanist attained by his father when keeper of the Kew Herbarium; but it is obvious when, for example, he tells us that 'in the long run it may be that our present collections will prove obsolete,' and adds significantly, 'the scrap-heap is the sign and measure of all progress.' He does not understand that a public herbarium

fulfills a variety of purposes with which the 'schools' have, and can have, nothing to do. At the national herbarium, for example, the botanical history of the last two or three hundred years can be traced; the types of Linnean species, of the early American collectors, and the great Sloane Herbarium are therein preserved; and so far from showing any signs of becoming 'obsolete,' they are constantly consulted by botanists from all parts of the world, both by personal visits and by correspondence. Apart from these, the student of the British flora, the amateur botanist, the horticulturist, the elementary teacher and the intelligent inquirer find the herbarium a convenient center for prosecuting their studies, and for obtaining information which they could not readily obtain elsewhere. If Professor Oliver's ideal were realized, botany would become the sole possession of the schools; and not only the foreign systematist, but the general public, the private student, the amateur and the monographer would be excluded from consideration. The national herbarium and that at Kew are supported by public funds; it is, therefore, manifestly but common justice that the public, rather than the schools, should have the prior claim to their services.

The fact is that Professor Oliver looks at botany exclusively from his own somewhat narrow standpoint—that of a successful and capable teacher obsessed by the notion that teaching is the only thing worth troubling about. For this purpose there must be an alliance between the authorities of the herbaria and the 'local university'; for 'directly you give the keepers or assistants in the former a status in the latter, you place at the disposal of the systematists a considerable supply of recruits in the form of advanced students possessing the requisite training to carry out investigations under direction.' But where are these students to find employment? If the fusion of the two herbaria to which he looks forward would effect 'a great economy in effort, time and money,' it would seem that the openings for trained students would have to be reduced rather than increased.

Professor Oliver has not adduced convincing evidence of the organizing capacity of 'the local university,' or of the desirability of entrusting to it, or to 'the schools,' the sole management of botanical affairs. The London University, for example, has recently been severely criticized in the daily press for the mismanagement and neglect of the valuable libraries entrusted to its charge. The *Tribune* of August 16, says:

> The university, when it migrated from Burlington Gardens to its present quarters, had two magnificent collections of books—the 'Grote' and the 'De Morgan,' besides a considerable accumulation gathered at various times. When the removal took place the books were conveyed in trolleys by workmen, 'dumped down' anywhere, and allowed to remain in the utmost confusion exposed to great risk and damage. Rare editions were actually found later on at the bottom of the lift-hold in a pool of water. Books lay about in rooms where committees sat; any one who took a fancy to a volume carried it off, entering his name, and the name of the author, if he were very scrupulous, in a little washing-book. A porter was librarian, and the lift-boy sublibrarian. At one time it was proposed to make a subject-catalogue, and a former official of the university began to carry out the scheme on slips of paper, as he rode to and from his work on the omnibus. His notes have been preserved as a curiosity. He catalogued a famous antiquarian work on 'Seals' under 'Zoology.'

May it not be asked whether the universities or 'the schools' have done more for the advancement of 'botany in England' than men like Robert Brown and Sir Joseph Hooker, whose work was unconnected with either? Is it not the case that at the present time botany in our oldest university finds its most active exponent in the person of an amateur systematist?

One lesson which may be gathered from Professor Oliver's onslaught is the extreme importance of retaining the national herbarium under the management of trustees One shudders to think what would happen were it handed over to the tender mercies of men of his stamp, or to some purely bureaucratic body. This danger was pointed out by the

Westminster Gazette in its account of the British Association meeting:

> It is interesting to note the dangers to a scientific institution directly under our bureaucracy when Professor Oliver, in his address this morning to the botanical section, actually urges that the British Museum botanical collections should be transferred from the enlightened charge of the independent trustees to Kew, which is under the board of works. If government is to advance the pursuit of scientific research by subsidies, it must be content to entrust the disposal of these subsidies to boards of independent men.

It seems to us that, of course unconsciously, he has supplied a weighty argument in favor of retaining the two herbaria, so that if at one the 'dead Welwitschia' should be ousted by the 'live dandelion,' the former may yet be retained in safe custody for the benefit of future students.

Much more might be said did space allow. It would be possible, for instance, to show more fully what has already been indicated—namely, that Professor Oliver is hardly qualified, either by knowledge or by position, to pronounce judgment upon matters as to which older if not wiser men have expressed very different opinions. We think that, on reflection, he will regret that he introduced what was felt by many who heard it to be an element of discord into an assembly of botanists from all parts of the country. 'He is evidently,' as Bentham said of Naegeli, 'a man of great ability and zeal, and a constant and hard worker'; and we can only hope that increasing years will enable him to take broader views, and at least to recognize that his individual standpoint is not the only one, and need not necessarily be the best.

James Britten.

Note.—The death of Mr. C. B. Clarke since the above was written suggests the mention of him as one who was in no sense a creation of 'the schools,' and whose name will always be associated with Kew, where he did most of his work, and with the national herbarium, to which he was a frequent and welcome visitor. —*The Journal of Botany.*

Current Notes on Meteorology.

The Monthly Weather Review.

The July, 1906, number of the *Monthly Weather Review* (dated October 11) contains the following papers:

'The Waterspout seen off Cottage City, Mass., on Vineyard Sound, on August 19, 1896,' by Professor F. H. Bigelow. This is one of a series of papers on the thermodynamics of the atmosphere, and is the most complete discussion of a waterspout which we have ever seen. Several excellent half-tones are given. An early notice of this waterspout and of some of the photographs here reproduced was included in these notes in Science, N. S., Vol. IV., 1896, 718–719. Professor Bigelow has made a careful study of all the available accounts of this waterspout, and has made calculations as to its dimensions.

'Climatology of Porto Rico from 1867 to 1905, inclusive,' by W. H. Alexander. Mr. Alexander has already contributed other studies of West Indian climatology. The present paper contains numerous tables of climatological data which will be valuable to any one who seeks information regarding Porto Rican climate.

'Snow Rollers,' by Wilson A. Bentley. Mr. Bentley's name is well known in connection with his remarkable studies of snow crystals by micro-photography. The present article deals with the formation of 'snow rollers' at Jericho, Vt., on January 18, 1906, and is illustrated by means of two half-tones. 'Snow Rollers at Mount Pleasant, Mich.,' by Professor R. D. Calkins, is another study of a similar occurrence, at a different place.

Mammato-cumulus clouds.

The September, 1906, number of the *Meteorologische Zeitschrift* contains a study of mammato-cumulus clouds by H. Osthoff, with some illustrations reproduced from drawings. In all, sixty-seven observations of this peculiar cloud form were made by the writer, the majority being in summer and during the warmer hours. A rapid disappearance of the cloud was noted as characteristic, the form being a passing stage of an existing cloud.

The writer believes that the probable cause of the mammato-cumulus is to be found in a descending air movement, which, however, in view of its usually being very limited in area, seldom reaches down to the lowest air strata.

BIRD MIGRATION AND WEATHER IN HUNGARY.

THE spring dates of arrival in Hungary of migrating birds have been studied in relation to weather conditions for the period 1894–1903, by J. Hegyfoky, who presents the general results in the September number of the *Meteorologische Zeitschrift*. Weather which is warm and pleasant accelerates the arrival of the birds, while unpleasant cool weather delays their coming. When high pressures prevail over the continent the arrival is regular, but when depressions, of short duration, occur, the arrival is irregular.

NOTES.

J. R. SUTTON, meteorologist of the De Beers Consolidated Mines at Kimberley, continues his valuable discussions of the meteorology of the South African table-land in a paper on 'The Climate of East London, Cape Colony' (*Trans. So. Afr. Phil. Soc.*, XVI., 3, August, 1906).

R. DEC. WARD.

BOTANICAL NOTES.

PAPERS ON FUNGI.

Two years ago Dr. G. P. Clinton, of the Connecticut Experiment Station, published a very helpful monograph of the North American *Ustilagineae* (*Proc. Boston Society Nat. Hist.*, Vol. 31) which was noticed in this journal (SCIENCE, July 7, 1905). The same author has published another paper on the same group of plants, but for a restricted area under the title, 'The Ustilagineae, or Smuts, of Connecticut.' It constitutes Bulletin No. 3 of the State Geological and Natural History Survey, and includes forty-four pages of text and seven full-page plates. There is first an introduction of seven pages in which the general characters, life history and economic importance of the smuts are discussed, and this is followed by a systematic key to the genera, of which there are twelve represented by species in the state. Under each genus, after its characterization there is a key to the species with the specific descriptions clearly drawn. No synonyms are included, but hosts and localities are given with much fulness. In all, forty-nine species and one variety are described. The plates (mostly half-tones) add much to the usefulness of the paper.

In 'A Preliminary Report of the Hymeniales of Connecticut' Professor Edward A. White published (in Bulletin 3 of the State Geol. and Nat. Hist. Survey) the results of his studies of the larger fungi (mainly toadstools and pore-fungi) of Connecticut. It constitutes a thick pamphlet of eighty-two pages of text, and forty excellent half-tone plates of photographs. As stated in the preface, the author's aim 'has been to compile as far as possible a complete and accurate list of native species, together with notes regarding the characteristic genera.' This plan has been so carried out that one finds here clear, non-technical descriptions of fifty-five genera, aided by the very good plates, and following each generic characterization is a list of the species with localities and notes in regard to edibility. There are enumerated of *Agaricaceae* 233 species, *Polyporaceae* 103, *Hydnaceae* 23, *Thelephoraceae* 18 and *Clavariaceae* 11. This pamphlet should prove useful to beginners in the study of the larger fungi in Connecticut, as by it the genus of any specimen can be determined, and that is all that the beginner should attempt. The identification of species may well be deferred until genera are pretty well fixed in mind.

Professor Doctor Arthur contributes to the volume 'Resultats scientifiques de Congrès international de Botanique Vienne 1905' a paper on the classification of the *Uredineae* based upon their structure and development ('Eine auf die Struktur und Entwicklungsgeschichte begründete Klassifikation der Uredineen'), in which he proposed an entirely new arrangement of the group. He divides the order *Uredinales* into three families, viz., *Coleosporaceae*, with seven genera (*e. g.*, *Coleosporium*, *Chrysospora*, etc.) representing three subfamilies; *Uredinaceae*, with twenty-

two genera (*e. g., Pucciniastrum, Chrysomyxa, Uredo, Cronartium, Endophyllum,* etc.) representing four subfamilies; and *Aecidiaceae,* with thirty-five genera (*e. g., Ravenelia, Uropyxis, Phragmidium, Aecidium* (*Gymnosporangium*), *Dicaeoma,* etc.) representing five subfamilies. The old genus *Uromyces* is split into *Nigredo, Uromycopsis, Klebahnia* and *Telospora,* while *Puccinia* is split into *Dicaeoma, Allodus, Bullaria* and *Dasyspora.* We hope to present a fuller account of this interesting study in the near future.

Dr. Arthur and F. D. Kern have published (in *Bull. Torr. Bot. Club,* vol. 33) a paper on the 'North American Species of *Peridermium,*' of form-genus of *Uredineae* inhabiting conifers. The authors distribute the species of *Peridermium* among the following actual genera: *Coleosporium* and *Cronartium* (on *Pinus*), *Pucciniastrum* and *Calyptospora* (on *Abies, Tsuga* and *Ephedra*), *Melampsorella* and *Melampsoridium* (on *Abies* and *Larix*) and '*Chrysomyxa*' (on *Picea* and *Abies*).

CALIFORNIA TREES.

About a year ago Alice Eastwood issued 'A Handbook of the Trees of California' as one of the 'Occasional Papers' (IX.) of the California Academy of Sciences. In a thick pamphlet of 86 pages and 57 plates she has given such a popular account of the trees of California as must prove of great use to the botanical students of the Pacific coast. It will be useful also to botanists elsewhere, since it brings together in convenient form the names and descriptions of the trees known to be native of that region. In all, the author includes 134 species, of which 42 are Gymnosperms. There is but one species of palm and two Yuccas. Of other common genera there are of willows (*Salix*) 11 species, *Populus* 3, *Juglans* 1, *Betula* 1, *Alnus* 3, *Quercus* 13, *Celtis* 1, *Crataegus* 2, *Acer* 4 and *Fraxinus* 3. The state has no native elms, magnolias, lindens, beeches, hickories, chestnuts, persimmons, nor mulberries, but it has in the Madroño (*Arbutus menziesii*) and the California laurel (*Umbellularia californica*) two most interesting trees which go far towards making up for the loss of the former.

An especial interest attaches to this volume because it is one of the last issued by the California Academy of Sciences before its destruction by earthquake and fire, and still more because of the heroism of the author (who is also the botanical curator) through whose faithfulness and bravery some of the collections were saved. Such great devotion to duty, and entire indifference to personal danger as she displayed in the most terrifying experiences compel our highest admiration.

Charles E. Bessey.
The University of Nebraska.

DEGREES CONFERRED BY THE UNIVERSITY OF ABERDEEN.

Among the large number of doctorates of law conferred by the University of Aberdeen on the occasion of its recent quatercentenary, *Nature* selects the following as especially concerned with science:

Richard Anschutz, professor of chemistry, Bonn; Henri Becquerel, professor of physics, Paris; Sir James Crichton-Browne, Kt., Lord Chancelor's visitor in lunacy; Casimir de Candolle, Geneva; Frank Wigglesworth Clarke, chief chemist, U. S. Geological Survey, Washington; Yves Delage, professor of zoology and comparative anatomy, Paris; J. Deniker, librarian of the Museum of Natural History, Paris; W. Einthoven, professor of physiology, Leyden; Herbert Mackay Ellis, director-general, Naval Medical Service, London; Arthur J. Evans, keeper of the Ashmolean Museum, Oxford; Andrew Russell Forsyth, Sadlerian professor of pure mathematics, Cambridge; Sir Archibald Geikie, secretary to Royal Society; Arnold Hague, U. S. Geological Survey, Washington; H. J. Hamburger, professor of physiology, Groningen; Edward Hjelt, professor of chemistry, Helsingfors; Harald Höffding, professor of philosophy, Copenhagen; Ferdinand Hueppe, professor of hygiene, Prague; Howard A. Kelly, professor of gynecology, Johns Hopkins University, Baltimore; Surgeon-General Sir Alfred Keogh, K.C.B., director-general, Army Medical Service; Rudolf E. Kobert, professor of pharmacology,

Rostock; Casimir Kostanecki, professor of anatomy, Cracow; Hugo Kronecker, professor of physiology, Bern; Sir Francis H. Laking, Bart., G.C.V.O., physician in ordinary to His Majesty the King and the Prince of Wales; Commandatore Rodolfo Lanciani, professor of ancient topography, University of Rome; Charles Rockwell Lanman, professor of Sanskrit, Harvard University; Gustavus Mittag-Leffler, professor of mathematics, Stockholm; Oscar Liebreich, professor of pharmacology, Berlin; Sir Norman Lockyer, K.C.B., director of Solar Physics Laboratory, South Kensington; Sir Oliver Lodge, Kt., principal of Birmingham University; Friedrich Löffler, professor of hygiene, Greifswald; Donald Macalister, president, General Medical Council; A. B. Macallum, professor of physiology, Toronto; Sir John Macfadyean, principal of the Royal Veterinary College, Camden Town, London, N.W.; Lord M'Laren, vice-president, Royal Society of Edinburgh; Jinzo Matsumura, professor of botany, University of Tokyo, Japan; His Serene Highness Albert Honore Charles, Prince of Monaco; Wilhelm Ostwald, professor of chemistry, Leipzig; Edmund Owen, vice-president, Royal College of Surgeons of London; W. M. Flinders Petrie, professor of Egyptology, University College, London; Rev. George E. Post, professor of surgery in Johanite Hospital, Beirut; Sir Richard Douglas Powell, Bart., K.C.V.O., president of the Royal College of Physicians, London; Salomon Reinach, professor of archeology, Paris; Guglielmo Romiti, professor of anatomy, Pisa; Sir Henry E. Roscoe, late professor of chemistry, Owens College, Victoria University; Major Ronald Ross, C.B., Liverpool School of Tropical Medicine; Vladimir Scheviakoff, professor of zoology, St. Petersburg; Jakob Schipper, professor of English philology, Vienna; Dukinfield Henry Scott, hon. keeper, Jodrell Laboratory, Kew Gardens; William Napier Shaw, director of the Meteorological Office, London; Joseph J. Thomson, Cavendish professor of experimental physics, University of Cambridge; Frederick Trendelenburg, professor of surgery, University of Leipzig; Sir William Turner, K.C.B., principal of University of Edinburgh; Giuseppe Veronese, professor of analytical geometry, Padua; Hugo de Vries, professor of physiological botany, Amsterdam; J. William White, professor of surgery, Pennsylvania University; J. W. van Wijhe, professor of anatomy, Groningen, Holland; Sir John Williams, Bart., K.C.V.O., late professor of midwifery, University College, London.

THE FRANCO-AMERICAN EXPEDITION TO EXPLORE THE ATMOSPHERE IN THE TROPICS.

THE third cruise of the *Otaria,* the steam-yacht sent by M. Teisserenc de Bort, director of the private meteorological observatory at Trappes, near Paris, and by Mr. Rotch, director of the similar observatory at Blue Hill, near Boston, to explore the atmosphere over the tropical Atlantic has ended, and the yacht has returned to Havre after a very successful voyage of three months and a half.

Atmospheric soundings with balloons and kites were executed over the central part of the North Atlantic, the equatorial regions and the South Atlantic as far as Ascension Island. The soundings southwest and northwest of the Canaries confirm the conclusions reached during the two preceding cruises of the *Otaria,* namely, that the upper anti-trade blows from southeast or southwest, not only within the tropics but generally as far north as latitude 30°, and is found above the open ocean as well as above the Canaries. Farther north it is transformed into a westerly wind.

The observations with *ballons-sondes* revealed this new and important fact, that in summer over the equator, very low temperatures (reaching —80° C.) exist in the upper air above 12 kilometers, being analogous to those occurring in winter at the same height in our own latitude.

SOCIETY FOR THE PROMOTION OF INDUSTRIAL EDUCATION.

A PUBLIC meeting will be held at Cooper Union on Friday evening, November 16, at eight o'clock, under the auspices of the national Society for the Promotion of Industrial Education.

Mr. Milton P. Higgins, president of the organization committee, will introduce Dr. Henry S. Pritchett, president of the Massachusetts Institute of Technology, who will preside, and the following speakers will address the meeting:

Mr. Frank A. Vanderlip, vice-president of the National City Bank, 'Competition of the United States in the Markets of the World.'

Mr. Frederick P. Fish, president of the American Telephone and Telegraph Company, 'Industrial Education as a Means of Developing the Industries of the United States.'

Miss Jane Addams, Hull House, Chicago, 'The Importance of Industrial Education from the Social Standpoint.'

Dr. Nicholas Murray Butler, president of Columbia University, 'The Place of Industrial Education in the American System of Education.'

Mr. Frank P. Sargent, U. S. Commissioner-General of Immigration, formerly chief of Brotherhood of Locomotive Firemen, 'The Importance of Industrial Education to the Workingman.'

An address will also be made by Mr. Alfred Mosely, of London, and a letter from President Roosevelt upon the subject of the meeting will be read.

A meeting for the purpose of effecting a permanent organization will be held in room 19, Cooper Union, at 4 P.M., on the same day. All interested in the purposes of the organization are invited to attend this meeting as well as the evening meeting.

SCIENTIFIC NOTES AND NEWS.

Advantage will be taken of the twentieth anniversary of the isolation of fluorine to present a gold medal to M. Moissan.

In acknowledgment of his work in metallurgical research, Professor Henry M. Howe, of Columbia University, has received from the Russian emperor the order of the Knighthood of St. Stanislas. The honor was conferred by Baron Rosen, who gave the patent of knighthood, together with the star and cross of the order.

President Roosevelt has reappointed Dr. Robert M. O'Reilly to serve a second term of four years as Surgeon-General of the United States Army.

A farewell banquet was given recently in honor of Sir David Gill, the astronomer royal at the Cape, who left for England on October 3.

The University of Durham has conferred the degree of D.Sc. on Sir William White, lately director of naval construction and assistant controller of the royal navy; on Professor G. A. L. Lebour, professor of geology and vice-principal of Armstrong College, Newcastle-on-Tyne; on Mr. Charles A. Harrison, engineer to the Northeastern Railway Company, and on Mr. G. B. Hunter, shipbuilder.

Captain Amundsen, who has recently returned from navigating the northwest passage, is at present in this country. He has been entertained recently by the Geographical Society of Chicago.

Dr. Henry S. Pritchett, president of the Carnegie Foundation for the Advancement of Teaching, will give the address at the decennial founder's day exercises of the Thomas S. Clarkson Memorial School of Technology, Potsdam, N. Y.

A new wing of the Acland Home, Oxford, containing operating, sterilizing and anesthetic rooms, with open-air balconies, was opened by Professor Osler on October 13.

Dr. Ch. Wardell Stiles, of the Public Health and Marine Hospital Service, has been withdrawn from the commission which has been appointed to make a new commercial treaty with Germany.

M. Henri de Rothschild has given 20,000 fr. to Professor Poirier for the study of cancer.

Professor W. Somerville (M.A. Cant.), Sibthorpian professor of agriculture at Oxford University, has been elected to a fellowship at St. John's College.

The Gedge prize, Cambridge University, has been awarded to Mr. P. P. Laidlaw, for an essay entitled 'Some Observations on Blood Pigments.'

Dr. M. I. Pupin, professor of electromechanics at Columbia University, was a can-

didate for the Connecticut General Assembly from Norfolk, but was defeated.

PROFESSOR T. C. BEILSTEIN, professor of chemistry in the St. Petersburg Technological Institute, well known for his work in organic chemistry, especially for his work on the aromatic series, died on October 19, at the age of sixty-eight years.

THERE will be a civil service examination on November 14 for laboratory assistant, qualified in optics, in the Bureau of Standards at a salary of $1,000, and on November 27 and 28 for the position of assistant chemist in the Bureau of Chemistry, Department of Agriculture, at a salary of $1,800.

A FIRE in the power room of the Carnegie Institute, Pittsburg, on November 4, damaged the building, according to the daily papers, to the extent of $10,000.

IN view of the devastation caused by the sleeping sickness among the natives of certain districts of the Congo Free State, as well as among Europeans residing there, the king of Belgium has offered a prize of 200,000 francs to any person of any nationality who shall discover a cure for the said sickness, and also an additional sum of 300,000 francs for the purpose of making researches and experiments toward exterminating the plague.

THE Boston *Transcript* states that the Princeton archeological expedition to Syria has presented to the imperial Ottoman museum in Constantinople a mosaic pavement which was discovered by the expedition when it was in Jerusalem two years ago. Professor Howard Crosby Butler, who with Professor W. K. Prentice, Dr. Enno Littman and Frederick A. Norris composed the expedition sent out by Princeton, has returned from Constantinople, where during the past summer he superintended the laying of the mosaic in a position of honor in the new wing of the imperial museum.

ACCORDING to the *Journal of the American Medical Association* it is said that the Carnegie Institution is considering the discontinuance of the *Index Medicus* on account of lack of financial support.

A NUMBER of specimens of U. S. government standard teas, together with illustrations of the plant and descriptions of the process of tea-making, have recently been acquired by the Botanical Museum of Harvard University. A collection of prehistoric grains, with several specimens of fruits and bread, which were completely charred in the conflagrations by which the lake dwellings of the stone and bronze ages were destroyed, are also on exhibition. Seventy illustrations of a few wild flowers from the eastern United States, painted by Mrs. C. D. Murdoch, and specimens of 'Silver Sword' collected from the brink of the volcano Holeakala, Mani, Hawaiian Islands, have also been acquired.

THE trustees of the British Museum have just issued the fifth edition of the 'List of casts of fossils reproduced chiefly from specimens in the department of geology,' and a copy can be obtained on application to the director of the British Museum (Natural History). Compared with the fourth edition this list has nearly double the number of pages and gives particulars of no less than 800 plaster casts, which can now be procured by purchase or exchange. Most of these are of fossil vertebrates, among which we notice several of the highly interesting mammals recently discovered in the Fayum by Dr. C. W. Andrews. A model of the skull of *Phororhacos longissimus* has been added to the birds, while among the reptiles are some of the South African forms described by Seeley. Among invertebrates are casts of many of Sowerby's types of ammonites, and the type-specimens of many echinoderms. The list also offers for £5 a colored model of the Greenland Right Whale (*Balaena mysticetus*), scale one inch to one foot, made under the superintendence of Captain David Gray, S. S. *Eclipse*, 1885.

THE first meeting of the new session of the Royal Geographical Society takes place on November 12, when a paper on northeastern Rhodesia by Mr. L. A. Wallace will be read. According to the London *Times* this will be followed on November 19 by a paper on the Seychelles Islands by Mr. Stanley Gardiner, who spent some time in the islands during his

cruise in the Indian Ocean last year. On December 10 Major H. Beacom, the American military attaché, will give an account of the changes that have been effected by irrigation in the United States. At a meeting during the course of the session, probably in the spring, an authoritative account will be given of the results of the Duke of the Abruzzi's expedition to the Ruwenzori Mountains. Among other papers that are expected during the session will be one by Dr. Fridtjof Nansen, in which he will discuss the polar problems that still remain to be solved. This, it is hoped, will be the first of a series of papers on the unknown and little-known parts of the world, the object being to take stock of what we now know of the geography of the globe, with a view to showing what remains to be done before our knowledge is complete. Lieutenant Boyd Alexander, who is expected shortly to arrive in England, will give an account of his expedition through Central Africa from the West Coast to the Nile. Colonel A. W. S. Wingate will give an account of the results which have been achieved during his nine years' directorship of the survey work in Northern China and Mongolia. Major C. D. Bruce will give a paper on his journeys through Central Asia to Northern China; and the following are among other papers that are expected during the session: 'The North Magnetic Pole and the Northwest Passage,' by Captain Amundsen; 'Aboriginal India,' by Colonel Sir T. H. Holdich; 'A Journey from Yunnan to Assam,' by Mr. E. C. Young; 'The Story of London Maps,' by Mr. Laurence Gomme; 'The Evolution of the Map of Africa,' by Mr. Edward Heawood; 'Inland Waterways,' by Mr. G. G. Chisholm; 'The Taupo Volcanic Region, New Zealand,' by Mr. J. Mackintosh Bell, the director of the New Zealand survey. Other subjects will be brought before the research department of the society for discussion; and it is hoped that a decided step will be taken in the inquiry, which was instituted some time ago, into the changes which have taken place on the North Sea coast of England during the historical period.

The new laboratory of physical and electrochemistry, which has been presented to Liverpool University by Mr. E. K. Muspratt, president of the council, was opened on October 13 by Sir William Ramsay, F.R.S. The London *Times* states that the new laboratory makes an addition of high importance and value to the university's equipment, and also confers upon Liverpool the distinction of being the only city in the United Kingdom to possess a special and completely-equipped laboratory for the study of physical and electro-chemistry. The cost of the laboratory, which provides accommodation for forty-three persons, is over £15,000. The laboratory will not be in readiness for the commencement of its work until some time in November, the formal opening being arranged for October 13 with the object of securing the attendance of a number of foreign scientists. In the absence of Lord Derby, chancellor of the university, Vice-Chancellor Dale presided over a large and distinguished gathering, amongst others present being Professors W. Ostwald (Leipzig), R. Abegg (Breslau), Ruhemann (Cambridge), H. Goldschmidt (Christiania), E. Cohen (Utrecht) and Lash Miller (Toronto). Sir William Ramsay, in opening the laboratory, remarked that the chief duty of a chair of physical chemistry was to teach men to think for themselves. He advised that the students of that fascinating subject should be induced by example, precept, sympathy, exhortation, and by all means whereby young human minds could be influenced to extend the bounds of their subject. Physical chemistry was important, not only from a scientific, but also from an industrial point of view, and the erection of that laboratory might be viewed as a monument to the services rendered by physical chemistry to manufacture in the past as well as a tribute to its donor's belief in future benefits which would accrue from its study. In the history of man there had never been an age like ours for scientific progress. As was the Elizabethan era for poetry and literature, so was the present for scientific achievement. Within twenty-five years they had seen a new chemistry develop—the chemistry

of the ion—and they were now eagerly and anxiously following the growth of the chemistry of the electron.

The British Medical Journal says: "M. Clemenceau, the new prime minister of France, has created a ministry of labor; this has involved the readjustment of certain public offices, for to the new minister of labor has been assigned not only labor and insurance and providence funds formerly under the control of the minister of commerce and mines formerly belonging to the department of the minister for public works, but also poor relief and public sanitation departments hitherto directed by the minister of the interior. M. Clemenceau has gained more fame as a politician and political writer than as a physician, but he was at one time in practise in Paris, so that he must be well acquainted with the needs of the public health service, and it is rather surprising to find him sactioning an arrangement which assigns to a minister of labor, who will have so many other interests committed to his care, the incongruous duty of presiding over the public health administration."

THE London *Times*, usually very correct in its scientific news, contains the following remarkable announcement: "Professor Josef Nowack, the Austrian scientific authority, arrived at Plymouth yesterday by the North German Lloyd steamship Barbarossa, bringing with him 26 cases of the rare plant *Abrus precatorius nobilis*, which is said to have extraordinary properties in the prediction of atmospheric and seismic disturbances. The total number of specimens which the professor has collected in Mexico and Cuba is 1,400, and they were sent to London, where they are to be exhibited. Professor Nowack intends to establish an institute in England for the prediction of weather conditions and the forecasting of storms, earthquakes, volcanic eruptions and accumulations of fire damp in mines. His system, he explained, is primarily based upon the discovery of the weather plant, 'also upon *data* obtained from studies of sun-spots, statistics of natural phenomena throughout the world, and upon general studies in physics, geology, chemistry and the physiology of plants.' The weather plant, he explained, had been found peculiarly sensitive to magnetic influences, and when changes occur in the electric and magnetic forces of the atmosphere, its twigs and leaves perform peculiar and abnormal movements, each movement having a definite significance. By its aid earthquakes and other influences can be predicted 26 days in advance. One thousand of the plants have been placed in the Botanical Gardens, New York, and those now brought to England are to remain here. There are to be bureaux in Bombay, Tokio and San Francisco, and one institution already exists in Vienna. Professor Nowack says that he can issue daily forecasts showing from two to seven days in advance the lists of rainy, foggy, or fine weather. One station, he says, will be sufficient for an area of 3,000 square miles, covering the whole of Europe, North Africa and the North Atlantic Ocean. Much interest is taken in the professor's researches in Austria, where he has the support of the emperor and the government."

CONSUL URBAIN J. LEDOUX reports from Prague that Austrian papers are discussing the introduction of the Kjellin process in the manufacuture of steel by the Poldihütte, at Kladno, Bohemia, in concert with the Oberschlesische Eisenindustrie-Gesellschaft, which process, says the Prague *Tageblatt*, may bring about a complete revolution in the Austrian steel industry. Continuing, the *Tageblatt* says: That such steps may be leading to vastly important results may easily be realized when it is considered that the Kjellin process yields an excellent steel, said to be fully equal to the best crucible steel, while the cost of production is considerably lower than with the mode of production so far in use. The Kjellin product, however, apart from its lower cost, is further praised for its ductility, density, homogeneousness, softness, the possibility of obtaining high degrees of carboniferous quality and, finally, for its excellent magnetic properties. If these surmises—as appears highly probable—should be proved by facts, all undertakings which have at their disposition the primary requisite for the adaptation

of the electric process, viz., cheap electric power by means of sufficiently strong water power, will secure a great advantage over other works. Chief Engineer V. Engelhardt, in his work on the Kjellin process, states that it can compete with the Siemens-Martin method, where the kilowatt hour can be put down at about a half cent.

UNIVERSITY AND EDUCATIONAL NEWS.

At the University of Wooster the addition to the library is nearing completion. The finished building will represent an expenditure of $71,000, all of which has been provided by Mr. Henry C. Frick. At the cost of $80,000, a dormitory is being built which will accommodate ninety young women.

The University of Nebraska plans to build an engineering hall (costing $100,000), a horticultural hall (costing $40,000) and a heating plant for the School of Agriculture ($40,000). Plans have been made to ask the legislature for an increase in the appropriation for the woman's building so as to make it $80,000.

Mr. John Charlton has given $50,000 to Queens University, Kingston, to endow a chair of moral philosophy.

Mr. Andrew Carnegie, lord rector of St. Andrews University, has given £10,000 to build a new university library; he has also given £12,500 to Dundee University College for a physical laboratory.

The University of Pennsylvania is about to begin a number of special courses, practically constituting a new department, by which school teachers, both men and women, will be able to obtain the regular college degree of bachelor of arts or bachelor of science.

At a meeting of the regents of the University of Nebraska, October 23, the grade of 'head professor' was established and the following appointments under this title were made for the subjects named: G. E. Barber (Latin); L. A. Sherman (English literature); C. E. Bessey (botany); J. T. Lees (Greek); H. W. Caldwell (American history); E. H. Barbour (geology); F. M. Fling (European history); E. W. Davis (mathematics); Lawrence Bruner (entomology); Laurence Fossler (German); H. B. Ward (zoology); G. W. A. Luckey (education); W. G. L. Taylor (political economy); C. R. Richards (mechanical engineering); O. V. P. Stout (civil engineering); E. A. Burnett (animal husbandry); A. T. Peters (animal pathology); Samuel Avery (chemistry); Roscoe Pound (law); G. E. Howard (sociology). It was further ordered that these 'head professors' should constitute the 'university senate.'

Dr. Andrew F. West, professor of Latin at Princeton University and dean of the graduate school, has declined the offer of the presidency of the Massachusetts Institute of Technology made to him by the executive committee of the corporation.

The following appointments have been made in the department of philosophy in the University of Michigan: Mr. Roy W. Sellars, A.B. (Mich.), sometime fellow of the University of Wisconsin, to be instructor in philosophy; Mr. John F. Shepard, B.S., Ph.D., to be instructor in psychology; Mr. Frank van Vliet and Mr. L. W. Elder to be George S. Morris memorial fellows in philosophy.

Mr. Samuel W. Collett, fellow in botany, State University of Iowa, has been appointed instructor, *ad interim,* in the State College of Washington.

Dr. G. H. F. Nuttall, M.D., F.R.S., fellow of Christ's College and reader in hygiene in the University of Cambridge, has been elected to the newly-created Quick professorship in biology. His duties are to devote himself to the study of the protozoa, especially such as cause disease. Dr. Nuttall was at one time associate in hygiene at the Johns Hopkins University.

Mr. W. L. H. Duckworth, M.D., Sc.D., fellow of Jesus, has been appointed demonstrator of anatomy in Cambridge University.

At Trinity College Mr. F. J. Dykes, M.A. (Cambridge), late lecturer in mechanics at the Royal Naval College, Portsmouth, has been elected fellow and lecturer.

Mr. J. W. McBain, M.A. (Toronto), has been appointed lecturer in chemistry in University College, Bristol.